

ABSTRACT OF THE DISCLOSURE

Magnetically enhanced glow discharge devices are disclosed for the purpose of PECVD, etching or treating a substrate in a vacuum chamber. Two cathode surfaces are separated by a gap. A mirror magnetic field emanates from the cathode surfaces and passes through the gap. An anode structure forms diverging electric fields from each cathode to the anode, where the electric fields pass through the magnetic field 360 degrees around the dipole magnetic field. A closed loop electron trap is formed by the diverging electric fields and the expanding magnetic field in the gap. With a chamber pressure in the range of 0.1 to 100 mTorr and an applied voltage between the cathode and anode surfaces, a plasma is formed in the electron trap and in the plane of the trap. By shaping the plasma poles and exposing the sides of the cathode surfaces to the substrate, the created Hall current of the plasma can be brought into direct contact with the substrate.